PROC. ENTOMOL. SOC. WASH.
100(3), 1998, pp. 553–565

REVISION OF NORTH AMERICAN *ALEIODES* WESMAEL (PART 4): THE *ALBITIBIA* HERRICH-SCHAEFFER AND *PRAETOR* REINHARD SPECIES-GROUPS (HYMENOPTERA: BRACONIDAE: ROGADINAE) IN THE NEW WORLD

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Abstract.—The *Aleiodes albitibia* Herrich-Schaeffer species-group is defined to include one Holarctic species, *A. albitibia* Herrich-Schaeffer, recorded here for the first time in North America. The *Aleiodes praetor* Reinhard species-group is defined to include *A. texanus* Cresson, *A. graphicus* (Cresson), **n. comb.**, and ***A. ceratomiae* Marsh and Shaw, n. sp.** *Aleiodes fumipennis* Cresson is a **new synonym** of *A. texanus* Cresson. The *A. albitibia* species-groups is regarded as monophyletic based on a smooth and polished mesopleuron and an unusual feature of the mummification process: an inflated bubble-like area is formed anteriorly in the notodontid hosts. The *A. praetor* species-group is regarded as monophyletic based on the strongly sinuate hindwing vein RS, compact flagellomeres, large ocelli, and parasitism of Sphingidae. The *A. albitibia* and *A. praetor* groups share an unusual feature of the mummification process: decapitation of the host larva. A key to the New World species of the *A. praetor* species-group is provided, and species treatments are given for Nearctic species, including diagnostic characters, distribution, and biological information.

Key Words: Braconidae, *Aleiodes*, parasitoids, revision

The rogadine braconid genus *Aleiodes* Wesmael is worldwide in distribution, but is particularly species-rich in the Holarctic Region. *Aleiodes* is diverse in North America, with at least 90 species in the United States and Canada (Shaw et al. 1997). This paper is the fourth contribution in a series of papers on *Aleiodes* species-groups, intended to provide a complete revision of the genus for North America (Shaw et al. 1997, Shaw et al. 1998, Marsh and Shaw 1998). In this paper we treat two distinctive monophyletic assemblages, the species of the *Aleiodes albitibia* and *praetor* species-groups, as they occur in North America. Our definition of species-groups includes all species known to us, worldwide. However, because our main intent is to provide a revision for species occurring in the United States and Canada, species treatments are limited to the Nearctic fauna. The European species are currently being revised by Kees van Achterberg and Mark Shaw.

Aleiodes species are koinobiont endopar-

asitoids of lepidopteran larvae, especially macrolepidoptera of the superfamilies Noctuoidea and Geometroidea, and to a lesser extent, Arctioidea, Sphingoidea, and Papilionoidea (Shaw et al., 1997). The method of parasitism, unique to the tribe Rogadini, is noteworthy: the *Aleiodes* larva completes its feeding and pupates within the shrunken and mummified remains of the host caterpillar (Figs. 1, 2). In most cases, the form of the mummy caused by a particular *Aleiodes* species is characteristic for that host and parasitoid, so the mummified remains are of considerable diagnostic and phylogenetic value and should be retained with the parasitoid, when reared. For more complete discussions of *Aleiodes* biology, readers may refer to Shaw (1983, 1994), Shaw and Huddleston (1991), Shaw (1995), and Shaw et al. (1997).

Members of the *albitibia* group are restricted to parasitism of Notodontidae, and have a smooth and highly polished mesopleuron (Fig. 14). An unusual feature of this group is that an inflated bubble-like area is formed anteriorly in the mummified host larva (Fig. 1). Shaw (1983) speculated that this may be an adaptation allowing the host mummy to float in marshy habitats. Members of the *praetor* group are restricted to parasitism of Sphingidae, have a strongly sinuate RS vein in the hindwing (Fig. 17) that sometimes nearly reaches the wing margin, large ocelli (Figs. 10–12), and compact flagellomeres (Fig. 13). These are the only *Aleiodes* known to parasitize sphingids, so the caudal horn of the mummy is of great diagnostic value (Fig. 2). Sometimes the caudal horn falls off as the mummy overwinters, but a distinct socket is still present. The *albitibia* and *praetor* groups may be sister-taxa, since they include the only *Aleiodes* species that cause decapitation of the host larva during the mummification process. Sometimes the host head capsule remains attached by a thin strip of cuticle, but it usually falls off as the mummy overwinters. Therefore these are the most common groups where host mummies are normally found with head capsules missing (Figs. 1, 2). In other species-groups, to a limited extent, the host head capsule may be lost as the mummy ages and is exposed to weather. However, in these cases it appears to be a more random and irregular event.

Methods

Species covered in this paper can be identified as members of the subfamily Rogadinae using the keys of Shaw and Huddleston (1991) or Shaw (1995). Our definition of *Aleiodes* follows that of van Achterberg (1991), Shaw (1993), and Shaw et al. (1997). Specimens can be determined as *Aleiodes* using the keys of Marsh et al. (1987), van Achterberg (1991), or Shaw (1997). Specimens keyed through Marsh et al. (1987) will key to couplet 185, at which point they can be separated from *Rogas* by the presence of a discrete median carina on the propodeum (Figs. 4, 6, 8), the lack of a foveate sternaulus on the mesopleuron, and the lack of a blunt basal tooth on the tarsal claw. In practice, more than 99% of U.S. and Canadian specimens encountered will be *Aleiodes*, as *Rogas* is only infrequently encountered north of Mexico. The species-groups of *Aleiodes* from North American north of Mexico can be keyed using the key provided in Shaw et al. (1997).

Morphological terminology follows that of Marsh (1989), Shaw (1993), Goulet and Huber (1993), and Shaw et al. (1997). Microsculpture terminology follows that of Harris (1979). A complete labeled diagram of wing veins was provided by Shaw et al. (1997), and veins of particular importance for the *praetor* species-group are indicated on figures 3, 5, and 7.

The tarsal claw of both groups are similar in having basal pectins of spine-like seta placed extremely close to the base of the claw (Figs. 15, 16). This has some diagnostic value, but can only be studied by use of scanning electron microscopy or dissection and slide-mounting of claws for study by compound microscope. When viewed by

dissecting microscope this structure usually remains hidden at the extreme base of the claw, and the claws appear simple.

Authorship of new species is attributed to the senior authors (PMM and SRS) in the order indicated.

Aleiodes Albitibia Species-Group

Included species.—*Aleiodes albitibia* (Herrich-Schaeffer 1838) and *A. fuscipennis* (Szépligeti, 1904).

Diagnostic characters.—Central disc of mesopleuron smooth and highly polished (Fig. 14); tarsal claw with broad gap between apical claw and basal pectin of 4–5 spine-like setae, gap 3× broader than basal width of largest spine-like seta in pectin; spine-like setae of tarsal pectin largest apically, gradually smaller basally; parasitoids of Notodontidae and possibly Geometridae; host mummy with an unusual expanded balloon-like anteroventral area (Fig. 1).

Remarks.—The European species, *A. albitibia* (Herrich-Schaffer), has a circumpolar distribution, and is recorded here for the first time in North America.

Aleiodes albitibia (Herrich-Schaeffer) (Figs. 1, 9, 14)

Rogas albitibia Herrich-Schaeffer 1838: 156. Transferred to *Aleiodes* by van Achterberg 1991.

Aleiodes heterogaster Wesmael 1838:94. Designated as type-species of *Aleiodes* by Viereck 1914. Synonymized with *albitibia* by van Achterberg 1991.

Diagnosis.—*Color*: head black, malar space and mouth parts yellow, antenna black; pronotum black, mesonotum black to honey yellow, scutellum honey yellow, mesopleuron honey yellow, occasionally black on upper anterior corner, venter honey yellow, propodeum black dorsally, honey yellow laterally, occasionally entirely honey yellow; metasomal terga usually black, first tergum with narrow medial yellow area and second tergum widely yellow medially, occasionally first and second terga almost entirely honey yellow, metasomal sterna yellow; legs honey yellow, hind tibia light yellow on basal half, brown on apical half, hind tarsus brown; wings hyaline, veins and stigma black, stigma occasionally with weak lighter spots at apex and base. Body length, 4.5–5.5 mm; forewing length, 4.0–5.0 mm. *Head:* eyes and ocelli large, covering most of head; 41–45 antennomeres, first flagellomere equal in length to second, all flagellomeres slightly longer than wide; malar space short, slightly less than basal width of mandible and ¼ eye height; temple narrow, slightly less than ½ eye width; occipital carina absent dorsally, meeting hypostomal carina; oral space small and circular, width equal to malar space; clypeus not swollen; ocelli large (Fig. 9), ocellocular distance about ½ diameter of lateral ocellus; face coriaceous rugulose, frons, vertex and temple coriaceous, occiput smooth and shining; maxillary palpus not swollen; mandibles small, tips not crossing when closed. *Mesosoma*: pronotum coriaceous rugose; mesonotum and scutellum coriaceous; notauli finely scrobiculate, meeting posteriorly on small rugose area; mesopleural disc smooth and shining (Fig. 14), subalar sulcus rugose, sternaulus absent; propodeum coriaceous rugose, median carina complete. *Metasoma*: short, not carapace-like but terga 4 and beyond very short and hardly exposed; first tergum rugose costate, length slightly less than apical width, median carina complete; second tergum rugose costate, median carina complete; third tergum rugose costate on basal ⅔, median carina present on basal ⅓; remainder of terga coriaceous; ovipositor about ⅓ length of hind basitarsus. *Legs:* tarsal claws with broad gap between apical claw and basal pectin of 4–5 spine-like setae, gap 3× broader than basal width of largest spine-like seta in pectin; spine-like setae of tarsal pectin largest apically, gradually smaller basally; inner spur of hind tibia less than ½ length of basitarsus; hind coxa smooth dorsally. *Wings:* forewing with vein r ½ length of 3RSa and ⅔ length

of m-cu, vein 1cu-a beyond 1M by distance slightly greater than length of 1cu-a, vein 1CUa nearly ½ length of 1CUb; hind wing with vein RS arched medially, marginal cell narrowest in middle, vein 1r-m equal in length to 1M, M+CU nearly twice as long as 1M, vein m-cu represented by short stub.

Specimens examined.—CANADA, ALBERTA: 1 ♂, 5.3 mi. S Waterton Gates W1. N. P., ex. *Caripeta divisata.* BRITISH COLUMBIA: 1 ♂, Terrace, May 31, 1962, ex *Caripeta divisata;* 1 ♂, Kootemay Bay, March 3, 1951, ex. *Caripeta divisata;* 1 ♂, St. Mary's Bay, April 17, 1961, ex *Caripeta divisata.* QUEBEC: Old Chelsea, Summit King Mtn., 1150', June 16, 1961, J. R. Vockeroth. IRELAND: 1 ♀, Athdown, 1 female, Co. Wi., A.M.G., host 4.ix.1938, em. 9.vii.1938, ex *Notodonta dromedarius,* A.W. Stelfox collection; 1 ♂, Athdown, Co. Wi., A.W.S., (1) 12.6. 1940, A.W. Stelfox collection; 1 ♀, Upper Liffey V., Co. Wi., reared specimen ex *Notodonta dromedarius,* A.W. Stelfox collection; 1 ♀, Co. Kd., A.W.S., Sept. 1946, ex larval skin of *Notodonta* sp. at Skerries Bog, em. June 1947, A.W. Stelfox collection. UNITED STATES, CALIFORNIA: 1 ♀, Calaveras Co., 4.8 km S. West Point, July 26, 1980, Stanley C. Williams; 1, ♀, Trinity Co., Alt. 5500, June 14, 1934. GEORGIA: 2 ♀, Forsyth, May 5–14, 1971, F. T. Naumann. ILLINOIS: 1 ♀, Carbondale, May 8, 1925, T. Frison. MAINE: Mt. Desert, Great Pond, July 16, 1918. MARYLAND: 1 ♀, Beltsville, June 3, 1988, G. Steck. MASSACHUSETTS: 1 ♂, Hyannis Port, July 4, 1909. MICHIGAN: 1 ♀, Midland Co., August 19, 1940. MISSOURI: 9 ♀, Williamsville, June 16, 1969 to June 19, 1970, J. T. Becker, Malaise trap. NEW YORK: 1 ♂, Ithaca, July 15, 1907. NORTH CAROLINA: 5 ♂, Highlands, May 26 to June 4, 1957, W. R. M. Mason and J. R. Vockeroth. OHIO: 4 ♀, 5 ♂, Shadywilde, Selma, June 18, 1963 to August 8, 1966, R. S. Boone, at light. OREGON: 2 ♀, Benton County, 10 mi NW Corvallis, Berry Cr., August 11, 1985, J. C. Miller and B. Scaccia. Deposited in USNM, CNC, RMSEL, MCZ, TAMU, UCD.

Distribution.—Previously recorded by Shenefelt (1975) as occurring in the Palearctic region (Belgium, England, Finland, France, Germany, Hungary, Ireland, Netherlands, Russia, Sweden, and Switzerland). Recorded here for the first time as being widely distributed over Canada and the entire northern United States, from Quebec south to Georgia, west to British Columbia, Oregon, and California. Because this is the first published record of this species being present in North America, a complete list of specimens examined is given above.

Biology.—Two specimens from Oregon were reared from the notodontid *Nadata gibbosa* (J.E. Smith) collected on *Quercus garryana* Hooker. In Europe, this species has been reared from other arboreal notodontids including *Notodonta dromedarius* (L.) and *Phaeosia* sp. (Shenefelt 1975, Shaw 1983). The host mummies that we have seen from Europe and Oregon are very similar in appearance (see Fig. 1). Four specimens from Canada were labeled as reared from the geometrid *Caripeta divisata* Wlk., but this record needs confirmation.

The unusual form of the mummy (Fig. 1), with an expanded bubble-like area antero-ventrally, is unique for the genus. The mummy is also unusual for *Aleiodes* in that no antero-ventral "glue-hole" is formed, and the mummy is not stuck to the substrate. Shaw (1983) speculated that this swollen area may serve as an "air sac" allowing the host mummy to float in water. The preserved mummies that we examined (N = 7) all had a swollen antero-ventral area that is of equivalent size to the posterior area, and the head capsule was always off or missing. Thus the anterior "chamber" often has a visible hole that could be interpreted as an exit hole. The edges around the anterior hole are slightly ragged, as are the edges around the posterior exit hole. Interiorly, the anterior and posterior chambers are divided by a tough wall of

Figs. 1, 2. Mummified host remains, lateral view. 1, Mummy of the notodontid *Caripeta divisata* associated with *Aleiodes albitibia*; note expanded, lighter-colored, anteroventral area (upper right). 2, Mummy of an unidentified sphingid associated with *A. texanus* and head capsule from another dead host larva (upper right); note caudal horn (bottom center) and absence of head capsule on mummy (upper left).

silk, and both chambers are lightly lined by silk. However, we only observed larval and pupal remains in the posterior chamber. Thus, the presence of a silk lining in the anterior chamber suggests that the inflated area may be partly the result of structural reinforcement by silk during late instar larval feeding. The anterior openning may be the result of a weakened area due to feeding by the parasitoid larva, or might result from a later process of inflation of the "air sac" area.

Comments.—*Aleiodes albitibia* can be easily distinguished from all other North American species by the central disc of the mesopleuron, which is smooth, highly polished, and devoid of setae (Fig. 14). Other North American species either have visible microsculpture in this area, or if it appears polished (rarely), then the central disc is also punctate and setose. It differs from its South American relative, *A. fuscipennis* (Szépligeti), by having hyaline wings. *A. fuscipennis* has smokey black wings and the dorsa of the mesosoma and metasoma are bright reddish orange.

The North American specimens of *A. albitibia* examined show more range of color variation (often being more orange or yellow) as compared with European specimens (which have more extensive black color on the body).

Aeiodes Praetor Species-Group

Included species.—*Aleiodes praetor* Reinhard 1863 (= *Neorhogas luteus* Szé-

pligeti 1906), *A. texanus* Cresson 1869 (= *A. fumipennis* Cresson 1869), *A. graphicus* (Cresson) 1872, **new combination**, and *A. ceratomiae* Marsh and Shaw, **new species.**

Diagnostic characters.—flagellomeres compact (Fig. 13); radiellan cell narrowest medially, wider apically; radiellan vein strongly sinuate (Fig. 17), sometimes nearly touching wing margin medially; malar space/mandibular base length less than 1; rounded protuberance present at propodeal apex; tarsal claw with very broad gap between apical claw and basal pectin of 6–10 spine-like setae, gap 7–8× broader than basal width of largest spine-like seta in pectin; spine-like setae of tarsal pectin largest apically or preapically, gradually smaller basally; parasitoids of Sphingidae.

Remarks.—This is a well-supported, circumpolar monophyletic group, associated with Sphingidae *sensu stricto*. All *Aleiodes* known to be associated with Sphingidae can be assigned to this group. The mummies with a caudal horn are distinctive and diagnostic (Fig. 2), but the caudal horn sometimes falls out, leaving a distinct pit, as the mummy ages. The host mummy is attached to the substrate by a very large anteroventral glue-hole. The head capsule is either decapitated, or remains by a small piece of cuticle that is prone to breaking away as the mummy ages (overwinters). Consequently, the host mummies are usually found without the head capsule, or with the head capsule detached.

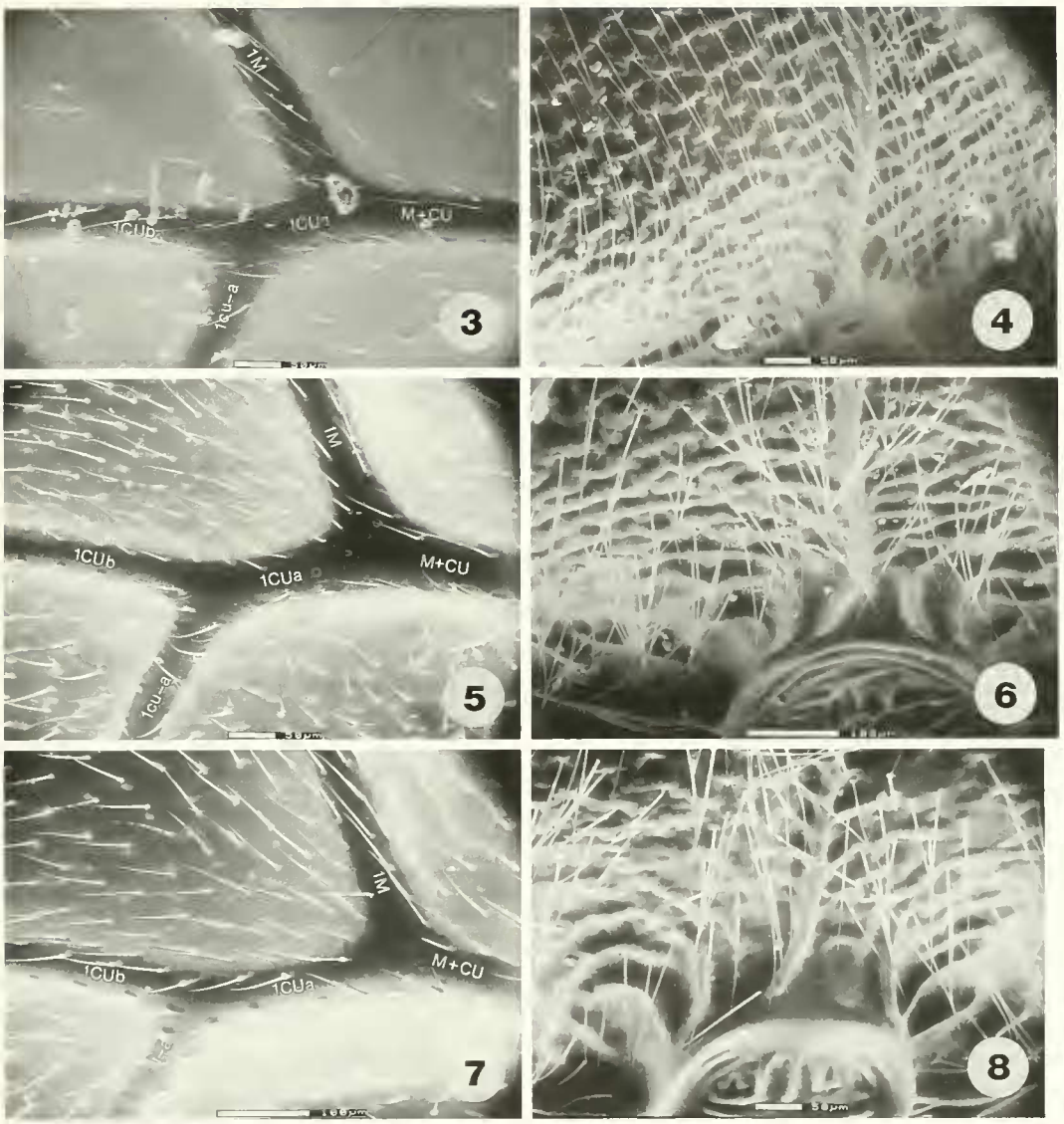
This group has been treated as a genus and a subgenus, *Neorhogas*, by Szepligeti (1906) and van Achterberg (1991), respectively.

Key to the North American Species of the *A.* Praetor Species-Group

1. Head orange or yellow, same color as rest of body, occasionally with some black markings but never entirely black . . . . . *A. graphicus* (Cresson)
– Head entirely black or dark brown, differently colored than at least propodeum . . 2
2(1). Metasoma black, at least beyond first tergum; vein 1cu-a of forewing nearly interstitial with vein 1M, vein 1CUa nearly absent (Fig. 3); ocelli exceptionally large, lateral ocellus nearly touching eye margin (Figs. 10, 18) . . . *A. ceratomiae*, new species
– Metasoma red; vein 1cu-a of forewing not meeting vein 1M, vein 1CUa about as long as 1cu-a (Fig. 7); ocelli not so large, lateral ocellus clearly separated from eye margin (Figs. 12, 19) . . . . . *A. texanus* Cresson

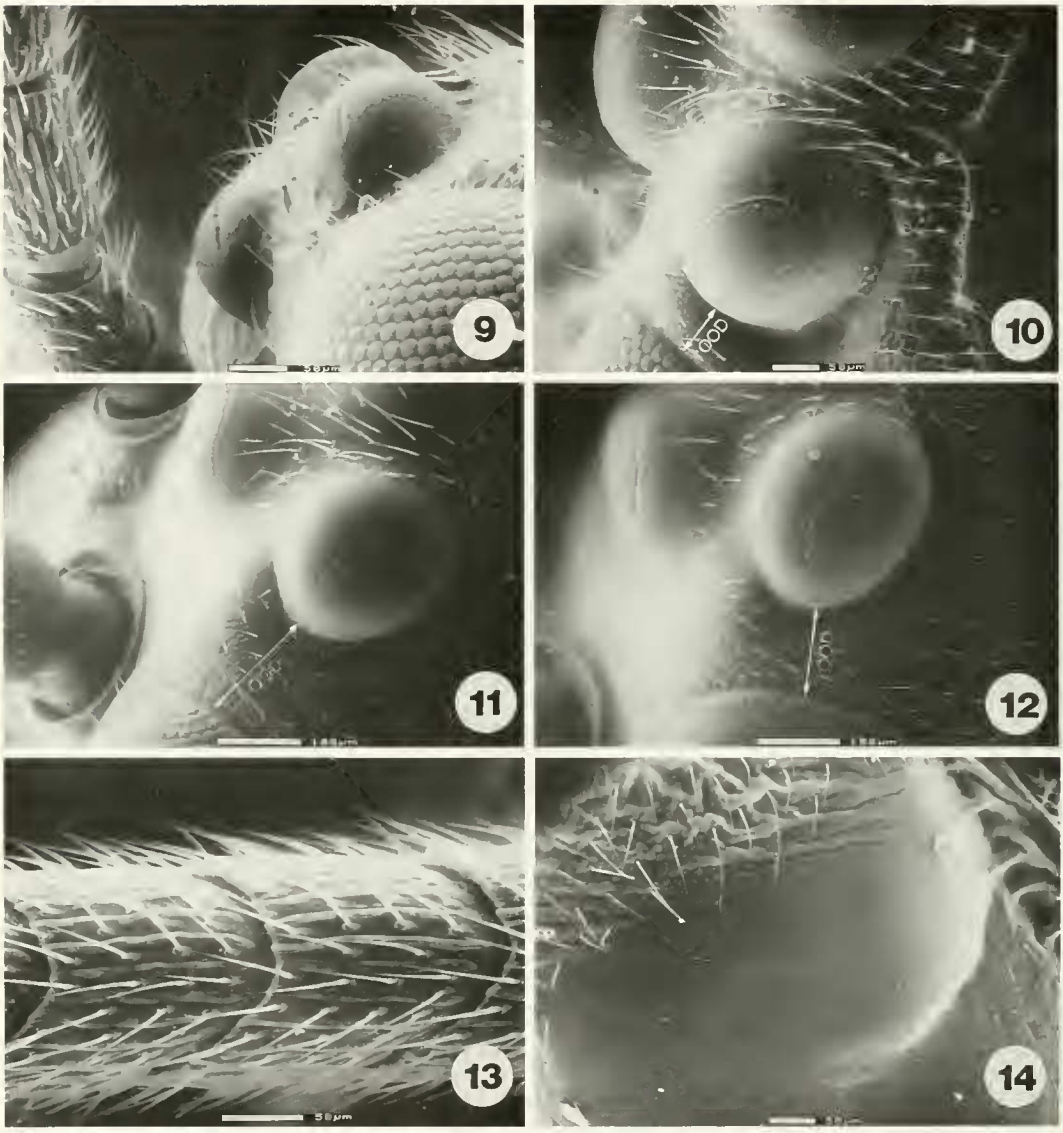
Aleiodes ceratomiae Marsh and Shaw, new species
(Figs. 3, 4, 10, 18)

Female.—*Body color*: head and antenna black, malar space yellow at base of mandible, mandible yellow medially, basal palpal segment black, remainder yellow; ocelli white; propleuron, pronotum, mesonotum and dorsoanterior corner of mesopleuron black, rest of mesosoma and propodeum yellow; metasoma black, occasionally first tergum yellow at base, ovipositor sheath black; legs yellow except fore and middle apical tarsal segments, apical half of hind tibia, and hind tarsus which are all black; wings hyaline. Body length, 9 mm; forewing length, 8 mm. *Head*: eyes and ocelli enormous, covering most of head (Figs. 10, 18); 65–66 antennomeres, first flagellomere only slightly longer than second, those beyond first at least slightly longer than wide; malar space short, 2/5 eye height and 3/4 basal width of mandible; temple narrow, 1/2 eye width; occipital carina meeting hypostomal carina; oral space small and circular, width slightly greater than malar space and half the face length; clypeus weakly swollen; ocelli enormous, lateral ocelli sometimes nearly touching eyes, lateral ocellus 3.5 to 6× greater than ocell-ocular distance (Fig. 10); face weakly rugulose, coriaceous on and above clypeus, with median longitudinal ridge below antenna; frons rugulose; vertex and temple coriaceous; maxillary palpus not swollen; mandible small, tips not overlapping when closed. *Mesosoma*: pronotum coriaceous rugulose; mesonotum and scutellum coriaceous; notauli scrobiculate, meeting posteriorly in triangular rugose area; mesopleuron very finely coriaceous,



Figs. 3–8. Left forewing venation and propodeal sculpture of *Aleiodes praetor*-group species. Environmental scanning electron micrographs at 200× magnification. 3, 4, *A. ceratomiae*. 5, 6, *A. graphicus*. 7, 8, *A. texanus*.

smooth dorsally, subalar sulcus rugose; sternaulus weakly impressed; propodeum coriaceous rugulose dorsally, coriaceous laterally, median carina complete, semicircular carina at apex of propodeum only weakly developed (Fig. 4). *Metasoma*: first tergum striate rugulose, slightly longer than apical width, median carina complete; second tergum striate rugulose, median carina complete; third tergum striate rugulose at base, remainder coriaceous, median carina absent; fourth and following terga coriaceous; ovipositor barely exerted, sheaths about ⅓ length of hind basitarsus. *Legs*: tarsal claw with very broad gap between apical claw and basal pectin of 5–7 spine-like setae, gap 8× broader than basal width of largest spine-like seta in pectin; second spine-like seta from apex of tarsal pectin largest, gradually smaller spines basally; in-



Figs. 9–14. 9–12, Dorsolateral views of head showing ocelli and ocell-ocular distances (OOD). 9, *Aleiodes albitibia*, 250×. 10, *A. ceratomiae*, 200×. 11, *A. graphicus*, 180×. 12, *A. texanus*, 180×. 13, Flagellum of *A. texanus*, 350×. 14, Smooth mesopleural disc of *A. albitibia*, lateral view, 200×.

ner spur of hind tibia less than ½ length of hind basitarsus; hind coxa coriaceous dorsally. *Wings*: forewing sparsely setose (Fig. 3), with vein or equal in length to 3RSa and m-cu, vein 1cu-a nearly interstitial with 1M, vein 1CUa very short and sometimes nearly absent (Fig. 3); hind wing with vein RS strongly arched, marginal cell extremely narrow in middle, vein 1r-m shorter than 1M, vein M + CU longer than 1M, vein m-cu only weakly indicated by short infuscated line.

Male.—Essentially as in female.

Holotype.—♀: CONNECTICUT, Putnam, from sphingid larva on ash, ex host August 2, 1956, *Ceratomia amyntor*, A. B. Klots. Deposited in USNM.

Paratypes.—CONNECTICUT: 1 ♂, Put-

Figs. 15, 16. Tarsal claws; note pectin of stout spine-like setae at extreme base. 14, *Aleiodes graphicus*, 469×. 16, *A. texanus*, 551×.

nam, A.B. Klots, host: *Ceratomia undulosa* (Walker) Sphingidae pupa in rear end of host larva 20 July 1956, ex pupa July 14, 1957. NEW HAMPSHIRE: 1 ♀, Durham, July 14, 1946, R. L. Blickle collr. NEW YORK: 1 ♀, Ithaca, at light, July 10, 1937, P. P. Babyi coll.; 1 ♂, Six Mile Creek, Ithaca, August 21, 1954, D. M. Anderson. ONTARIO: 1 ♀, N. Burges Twp., Lanark Co., August 8, 1981, D. M. Wood; 1 ♂, Belleville, April 30, 1930, C. W. Smith, host sphingid. Deposited in USNM, RMSEL, CAS, CNC, CUI.

Distribution.—Known only from eastern Canada and the northeastern United States.

Biology.—Reared from the sphingids *Ceratomia amyntor* (Geyer) and *C. undulosa* (Walker). The host mummy is only about 15mm long, indicating that the host is killed at an early stage of development (probably third instar).

Comments.—This species is quite distinct from *A. graphicus* and *A. texanus*, from which *A. ceratomiae* can be distinguished by its much larger ocelli (Fig. 10), hyaline and sparsely setose wings with vein 1cu-a nearly interstitial with vein 1M (Fig. 3), vein 1CUa very short to nearly absent, less coarse propodeal sculpture (Fig. 4), and metasoma mostly black. This species has enormous ocelli (Fig. 10), that are much larger than in any other known North American species of Braconidae.

Etymology.—The specific name refers to the hosts from which this species was reared.

Aleiodes graphicus (Cresson), **new combination**

(Figs. 5, 6, 11, 15, 17)

Rogas graphicus Cresson 1872: 188.

Diagnosis.—Body unicolored yellowish

orange, except antenna, ocellar triangle, tip of mandible, palpi, and legs at least from apex of femur apically black, wings dark; body length 7.0–8.0 mm; 55–60 antennomeres, most flagellomeres as long as wide; malar space shorter than basal width of mandible; face and frons rugulose, vertex and temple smooth; oral opening small and circular, diameter about equal to basal width of mandible; ocelli large (Fig. 11), diameter of lateral ocellus 1.5× greater than ocell-ocular distance; mesosoma largely smooth and shining, notauli strongly scrobiculate, scutellum margined by strong carina, propodeum rugulose, lateral corners protruding, median carina complete, semicircular carina at apex of propodeum well developed (Fig. 6); metasomal terga 1–3 costate-rugose, median carina strong and complete on terga 1–2, and basal half of tergum 3; tarsal claw with very broad gap between apical claw and basal pectin of 8–9 spine-like setae (Fig. 15), gap 8× broader than basal width of largest spine-like seta in pectin; spine-like setae of tarsal pectin largest apically, gradually smaller spines basally; forewing with vein or nearly as long a 3RSa, second submarginal cell quadrate, nearly rectangular; vein 1cu-a beyond 1M by distance equal to or slightly less than length of 1cu-a (Fig. 5); hind wing with vein RS strongly sinuate, marginal cell very narrow in middle.

Type material examined.—*Rogas graphicus* Cresson, lectotype male (designated by Cresson 1916), USA, Texas, Belfrage (ANSP), type # 2749, tip of left antenna missing; 1 paralectotype male, same data.

Distribution.—Recorded from Arizona, Colorado, Iowa, Kansas, New Mexico, South Dakota, Texas, and Wyoming.

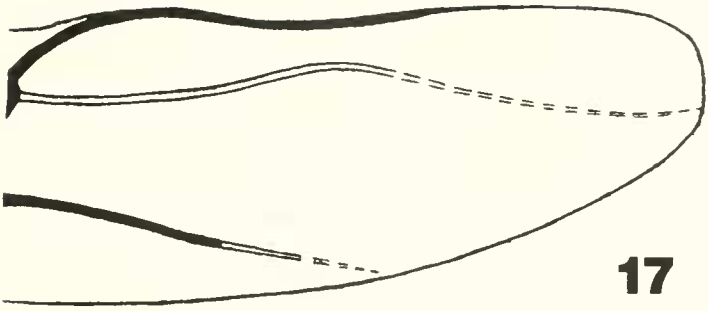
Biology.—This is a parasitoid of unknown sphingid species. There is a reared specimen in the AEI collection, but the host is not identified. In form, the mummy is similar to that produced by *A. texanus*, but the *A. graphicus* mummy has distinctive black markings and is clearly a different host species than utilized by *A. texanus*.

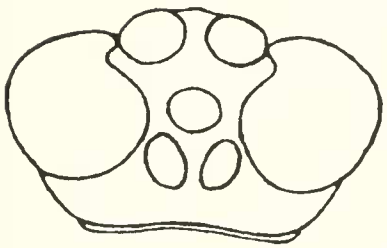
Comments.—*Aleiodes graphicus* is most similar to *A. texanus*, which also has dark wings. However, *A. texanus* has extensive black markings on the head and mesonotum, and so cannot possibly be confused with this mostly yellowish orange species. Until recently *graphicus* was classified as a species of *Rogas* (Marsh 1979), but it is correctly placed in the genus *Aleiodes*.

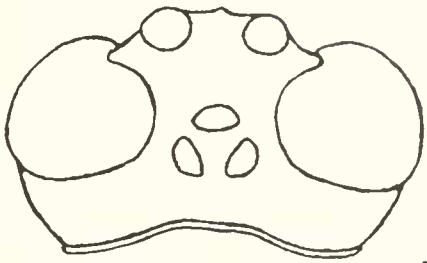
Aleiodes texanus Cresson
(Figs. 2, 7, 8, 12, 13, 16, 19)

Aleiodes texanus Cresson 1869:378.
Aleiodes fumipennis Cresson 1869:378. **New synonymy.**

Diagnosis.—Body bicolored, head including antenna and mouthparts black, mesosoma varying from entirely black to entirely reddish orange except propodeum always reddish orange, metasoma entirely reddish orange, legs varying from entirely black to reddish orange, wings dusky, veins black; body length, 7.0–8.5 mm; 58–62 antennomeres; malar space varying from slightly less to slightly longer than basal width of mandible; head smooth and polished, face often rugulose below antennae; oral opening small and circular, diameter equal to basal width of mandible; ocelli large (Fig. 12), diameter of lateral ocellus 1.0–2.3× greater than ocell-ocular distance; mesosoma smooth, pronotum rugose dorsally; propodeum rugulose, lateral corners protruding, median carina complete, semicircular carina at apex of propodeum well developed (Fig. 8); metasomal terga 1–2 strongly costate-ruguse, median carina complete; tergum 3 costate rugose on basal half, median carina occasionally indicated on basal ⅕; tarsal claw with very broad gap between apical claw and basal pectin of 8–10 spine-like setae (Fig. 16), gap 8× broader than basal width of largest spine-like setae of tarsal pectin largest apically, gradually smaller spines basally; forewing with vein or equal to 3RSa, second submarginal cell quadrate, nearly rectangular; vein 1cu-a beyond 1M by distance equal to or slight-







Figs. 17–19. 17, Hind wing of *Aleiodes graphicus* indicating sinuate RS vein. 18, 19, Head in dorsal view showing size and configuration of ocellar triangle. 18, *A. ceratomiae*. 19, *A. texanus*.

ly greater than length of 1cu-a (Fig. 7); hind wing with vein RS strongly arched medially, sometimes nearly touching wing margin, marginal cell very narrow medially, vein m-cu absent or weakly indicated by short fuscous line.

Type material examined.—*Aleiodes texanus* Cresson, lectotype female (designated by Cresson 1916), type # 1655, Texas (ANSP). *Aleiodes fumipennis* Cresson, holotype female, Illinois (ANSP).

Distribution.—Occurs throughout the eastern United States from Massachusetts west to Montana, southwards to the Gulf Coast, Texas, and northern Mexico.

Biology.—Reared from the Walnut Sphinx *Laothoe (= Cressonia) juglandis* (J.E. Smith) and other unidentified sphingids. Recently reared in Florida from sphingid larvae on grape, either *Amphion nessus floridensis* B.P. Clark or *Darapsa myron* (Cramer), or both (D. Wahl and K. R. Sime, personal communication). The host was most likely the latter but died before the identifying features developed. In all cases the host mummy was completely decapitated and firmly attached to the substrate.

Comments.—*Aleidoes texanus* is a fairly common species in North America. It is similar to *A. ceratomiae* in having extensive black on the mesosoma, but can be distinguished by the red metasoma and smaller ocelli. *A. texanus* is morphologically similar to *A. graphicus*, but can be distinguished by the black head and longer vein 1CUa (Fig. 7). Individuals of *A. texanus* exhibit a wide range of color variation on the mesosoma, from mostly black to mostly red, but the mesosoma is always bicolored with at least the pronotum black and the posterior red. Since *A. fumipennis* Cresson was separated from *A. texanus* only by color characters of the mesosoma, *A. fumipennis* is newly synonymized under *A. texanus*. We have seen a few individuals with unusually small ocelli, but whether or not these represent a

new sibling species cannot be determined without more biological information.

Acknowledgments

The following museums provided specimens for this study: Academy of Natural Sciences, Philadelphia (ANSP); American Entomological Institute, Gainesville (AEI); American Museum of Natural History, New York (AMNH); California Academy of Sciences, San Francisco (CAS); Canadian National Collection, Ottawa (CNC); Cornell University, Ithaca (CUI); Florida State Collection of Arthropods, Gainesville (FSCA); Illinois Natural History Survey, Urbana (INHS); Michigan State University, East Lansing (MISU); Mississippi State University, Mississippi State (MSSU); Nationaal Natuurhistorisch Museum, Leiden (RMNH); University of New Hampshire, Durham; Texas A. & M. University, College Station (TAMU); University of California, Davis (UCD); University of Minnesota, St. Paul (UMSP); Rocky Mountain Systematic Entomology Laboratory, University of Wyoming, Laramie (RMSEL); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

This research was supported by grant DEB-930-6314 from the National Science Foundation. Additional support was provided by supplemental Research Experience for Undergraduates grants in 1994, 1995, and 1996. Support was also provided by a Faculty Grant-in-Aid from the University of Wyoming Research Office, and U.W. Experiment Station Project WYO-256-90.

Additional thanks are due to Ms. Isobel Nichols for preparation of ink illustrations, and also to Ms. Teresa Williams, of the Western Research Institute, for assistance with the Environmental Scanning Electron Microscope and photography.

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